

REMARKS

Further and favorable reconsideration is respectfully requested in view of the foregoing amendments and the following remarks.

Claims 1-21 are pending in this application.

Claims 1 and 15 are amended to include the feature that the polyurethane (i) is “an aqueous polyurethane resin.” Support for this amendment can be found at paragraph [0016] of the specification.

Claims 1 and 15 are also amended to incorporate, from claim 2, that “the chain-extension agent (D) is at least one member selected from the group consisting of a diamine, hydrazine and a hydrazine derivative,” as a result of which claims 2, 3, 16 and 17 are amended to delete this feature.

Claims 1 and 15 are also amended to recite “the polyamine compound (iii) is at least one member selected from the group consisting of an alkylenediamine, a hydroxyl group-containing diamine, a polyalkylenepolyamine, an N-alkyl substituted alkylenediamine, an N-alkyl substituted polyalkylenepolyamine, an alicyclic polyamine, an aromatic polyamine, an adduct of the polyamine compound with an alkylene oxide and a urethane-modified polyamine compound.” Support for this amendment can be found at paragraphs [0055] and [0057] of the specification.

I. Claim Rejection Under 35 U.S.C. § 103

The Examiner rejects claims 1-21 under 35 U.S.C. § 103(a) as being unpatentable over Uchida et al. (U.S. Patent No. 6,569,533) (“Uchida ‘533”). Applicants respectfully traverse the rejection.

The aqueous resin composition having gas barrier properties according to claims 1 and 15 comprises the combination of (i) an aqueous polyurethane resin obtained by the reaction of specific components, and neutralizing the resultant product with a neutralizing agent, (ii) a swelling inorganic layered compound, and (iii) a specific polyamine compound. Uchida ‘533 fails to teach or suggest this specific combination.

With respect to the polyamine compound, the Examiner points out that Uchida ‘533 exemplifies 3-[N-(2-aminoethyl)amino]propylmethyldimethoxysilane, and that a polyamine can

be used together with the diamine component.

However, claims 1 and 15 recite that the polyamine compound (iii) “is at least one member selected from the group consisting of an alkylenediamine, a hydroxyl group-containing diamine, a polyalkylenepolyamine, an N-alkyl substituted alkylenediamine, an N-alkyl substituted polyalkylenepolyamine, an alicyclic polyamine, an aromatic polyamine, an adduct of the polyamine compound with an alkylene oxide and a urethane-modified polyamine compound.” Accordingly, claims 1 and 15 are not directed to an amino group-containing **silane coupling agent**. The polyamine compounds of claims 1 and 15 are clearly distinct from the silane coupling agent taught by the reference.

Although the Examiner points to the use of the polyamine compound together with a diamine component, Uchida ‘533 discloses that the polyamine compound is used merely as a chain-extending agent. In the reference, the chain-extending agent is incorporated into the chain of the polyurethane resin (i), or is combined with other monomer components for the formation of the polyurethane resin. That is, the resin compositions of the reference do not contain a free chain-extending agent in the form of a mixture of the chain-extending agent and a polyurethane resin.

Further, the reference discloses the addition of a layered inorganic compound and/or an amino group-containing alkoxysilane (3-[N-(2-aminoethyl)amino]propylmethyldimethoxysilane) to an aqueous polyurethane resin having an acid group, which has high concentrations of a urethane group and a urea group. However, the composition of the one concrete example that uses an amino group-containing alkoxysilane (Production Example 10) does not comprise any layered inorganic compound. Therefore, Uchida ‘533 does not teach or suggest the combination of both a layered inorganic compound and a polyamine compound.

Additionally, the reference discloses that **layered inorganic compounds are effective for improving the gas barrier properties** of the polyurethane resin. On the other hand, the reference also discloses that **the silane coupling agent is effective for improving the adhesion of the gas barrier polyurethane resin to a base material**. Thus, Uchida ‘533 does not teach or suggest a relationship between the **silane coupling agent** and gas barrier properties. Plus, the polyamine compounds used in the present invention are different from silane coupling agents

used in Uchida '533, which do not provide adhesion properties of the aqueous polyurethane resin.

Further, the amino group-containing alkoxysilane of Uchida '533 is described as a component for improving adhesion to a base material having the same level or rank as other various alkoxysilanes having a halogen atom, an epoxy group, a mercapto group, a vinyl group or a group having an ethylenic unsaturated bond. Thus, one of ordinary skill in the art would not have concluded that a polyamine compound **without** an alkoxysilyl group has the same function as an alkoxysilane with an amino group, such as 3-[N-(2-aminoethyl)amino]propylmethyldimethoxysilane, from the disclosure of Uchida '533. Accordingly, one of ordinary skill in the art would not have obtained any suggestion from this reference that would have led the art-skilled to use a polyamine compound, which does not have an alkoxysilyl group.

Considering Uchida '533, one skilled in the art would not only fail to select the specific polyamine compound of claims 1 and 15, which is quite different in properties from silane coupling agents, but also would fail to combine such a specific polyamine compound, the aqueous polyurethane resin having a neutralized acid group, and the swelling inorganic layered compound.

Moreover, one of ordinary skill in the art would not have expected an improvement in gas barrier properties with a polyamine compound having no alkoxysilyl groups in view of Uchida '533. According to the reference, since a polyurethane resin is combined with a layered inorganic compound and/or a silane coupling agent (e.g., an amino group-containing alkoxysilane), the use of a layered inorganic compound may ensure gas barrier properties, and/or the use of the silane coupling agent may result in improved adhesion to the base. However, as described above, the adhesion properties, and the gas barrier properties have no technical relationship to each other. Thus, there would have been no reason or rationale to have predicted the improvement in gas barrier properties with a polyamine compound without an alkoxysilyl group based upon the disclosure of Uchida '533.

The film of Production Example 10 of the reference shows a relatively lower oxygen permeability, as shown in Table 1 of Uchida '533 as the "Laminated Film 10," which contains 3-[N-(2-aminoethyl)amino]propylmethyldimethoxysilane. However, because the use of a polyamine compound without an alkoxysilyl group would not have been suggested from the disclosure of the amino group-containing alkoxysilane of Uchida '533, a relationship between a polyamine compound without an alkoxysilyl group and gas barrier properties would not have been predicted from the reference. Thus, the remarkable improvement in gas barrier properties of the claimed composition would not have been obvious over the reference.

Further, the claimed composition provides unexpected results in terms of oxygen permeability over the reference. In the present invention, because the specific polyurethane resin (i), the swelling inorganic layered compound (ii) and the specific polyamine compound (iii) are combined with each other, gas barrier properties are remarkably improved even under highly humid conditions.

Specifically, as shown by the comparison of the Examples and the Comparative Examples in the present specification, the oxygen permeability under a condition of 80% relative humidity ("80%RH") is improved to 8.3-15.2 in the Examples, which include a polyamine compound. On the other hand, Comparative Examples 1 and 2, which do not have any polyamine compounds, have oxygen permeability values at 80%RH of 24.0 and 27.4, respectively. See Tables 1 and 2 of the specification.

Further, Comparative Example 3, which corresponds to the Production Example 10 of Uchida '533, and which does not comprise a swelling inorganic layered compound, shows low oxygen permeability, such as 45 (under a condition of 50%RH) and 139 (under a condition of 80%RH). See Table 2 of the specification. On the contrary, the oxygen permeability is remarkably improved in the Examples of the present specification, to 2.5-5.8 (under 50%RH) and 8.3-15.2 (under 80%RH).

Accordingly, the claimed aqueous resin composition having gas barrier properties shows unexpected results in terms of oxygen permeability over Uchida '533.

Therefore, in view of the foregoing, claims 1 and 15 would not have been obvious over Uchida '533. Claims 2-14 and 16-21 depend directly or indirectly from claims 1 and 15, and

thus also would not have been obvious over Uchida '533. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

II. Double Patenting

The Examiner rejects claims 1-21 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-11 of U.S. Patent No. 6,979,493 (Uchida '493). The Examiner also rejects claims 1-21 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-11 of Uchida '533. Applicants respectfully traverse the rejections.

The arguments above regarding Uchida '533 are equally applicable to both of these rejections. [Uchida '493 is a division of Uchida '533.] Moreover, claims 1 and 15 are amended to include the features that (1) the polyurethane (i) is "an aqueous polyurethane resin"; (2) "the chain-extension agent (D) is at least one member selected from the group consisting of a diamine, hydrazine and a hydrazine derivative"; and (3) "the polyamine compound (iii) is at least one member selected from the group consisting of an alkylenediamine, a hydroxyl group-containing diamine, a polyalkylenepolyamine, an N-alkyl substituted alkylenediamine, an N-alkyl substituted polyalkylenepolyamine, an alicyclic polyamine, an aromatic polyamine, an adduct of the polyamine compound with an alkylene oxide and a urethane-modified polyamine compound."

Claims 1-11 of Uchida '533 and claims 1-11 of Uchida '493 do not recite or suggest these claimed features.

Moreover, claim 6 of Uchida '533 is directed to a silane coupling agent, and, as discussed above, one of ordinary skill in the art would not have concluded that a polyamine compound without a silyl group has the same function as an amino silane compound.

Therefore, claims 1-21 of the present application would not have been rendered obvious by claims 1-11 of Uchida '533.

The same reasoning applies to item 4 on page 7 of the Office Action.

Uchida '493 claims an aqueous dispersion comprising a gas barrier polyurethane resin, wherein the polyurethane resin comprises a plurality of urea groups and a plurality of urethane groups; the polyurethane resin has a total concentration of urea groups and urethane groups of 30

to 42.9% by weight based upon the total weight of the polyurethane resin; the polyurethane resin comprises a diisocyanate selected from the group consisting of an aromatic diisocyanate, an araliphatic diisocyanate, and an alicyclic diisocyanate, a C₂₋₈ diol and a diamine having 8 or less carbon atoms; and the polyurethane resin has a glass transition temperature of 100 °C or higher (claim 1). The '493 patent also claims that the aqueous dispersion further comprises at least one member selected from the group consisting of a silane coupling agent and a layered inorganic compound (claim 6).

Applicants take the position that the presently claimed invention is patentable over claims 1-11 of the '493 patent for the same reasons as indicated above, concerning the distinctions between the present invention and Uchida '533.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.


III. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-21 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place the application in better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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